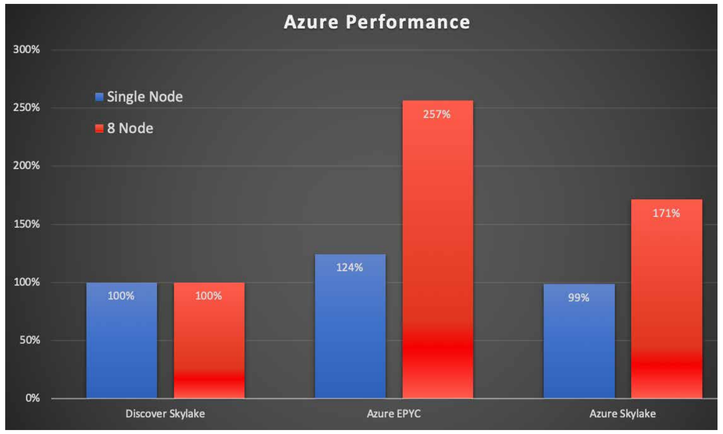
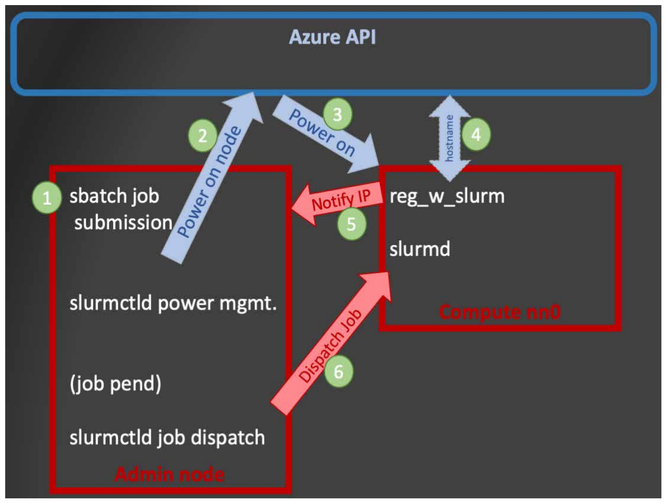
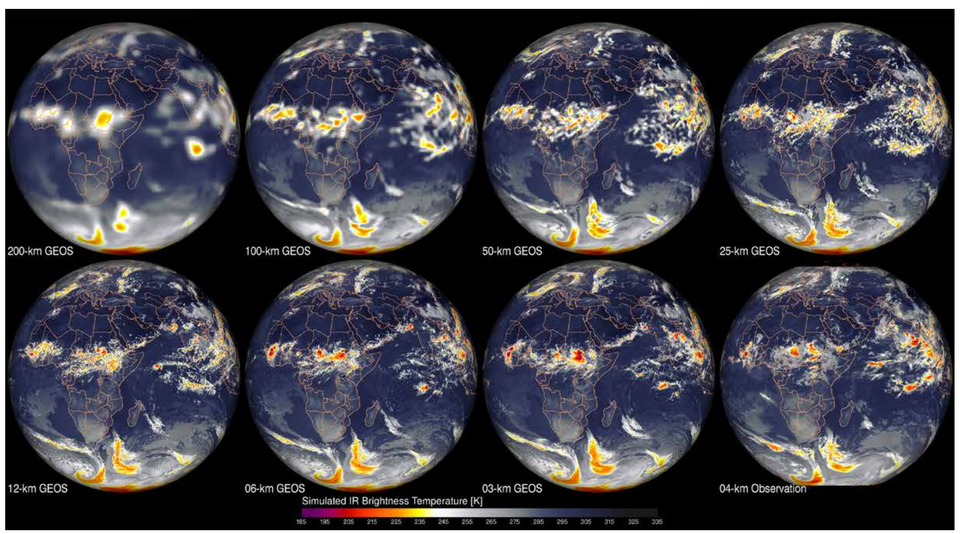


This graph represents the performance of the NASA GEOS climate model in the cloud using both Intel Skylake and AMD Naples versus Intel Skylake on premises. Single-node run, shown in blue, uses 2 x 3 x 6 grid decomposition and 36 cores; multi-node run, shown in red, uses 4 x 6 x 8 grid decomposition and 288 cores. Performance is relative to the on-premises NASA Center for Climate Simulation (NCCS) Discover Skylake cluster. Lower is better! *Mark Potts, RedLine Performance; Reid Ormseth, NASA/Goddard*



Workflow showing the automation via Azure. A user submits a job (1) to SLURM via the sbatch command. The SLURM power management will call the Azure API (2) to start up the necessary compute nodes (3). On boot, the new compute nodes will query the Azure metadata service (4) to check their system name and fix their hostnames and update DNS, before updating SLURM (5) with their correct IP information and starting the SLURM client daemon. Once SLURM sees the healthy compute node, it will dispatch the job (6). *Reid Ormseth, NASA/Goddard*



These snapshots from 40-day simulations—run on the NCCS Discover Skylake cluster—beginning on August 1, 2016 demonstrate the representation of convective clouds in the GEOS model. Shown here are simulated infrared brightness temperatures at resolutions ranging from 200 to 3 kilometers (km) compared with observed data at 4-km resolution (lower right). *William Putman, NASA/Goddard*

National Aeronautics and Space Administration

High-Performance Computing in the Azure Cloud

Microsoft Azure directly targets high-performance computing (HPC) with top-of-the-line CPUs and InfiniBand-based RDMA networking. While cloud computing can provide commensurate performance for HPC applications, many data center-centric technologies clash with cloud architecture and best practices. Terraform, Ansible, and cloud scripting provide rapid deployment of dynamic HPC clusters. Cloud-based resources are not yet priced competitively with on-premise resources, but the pricing is expected to continue converging. The NASA Center for Climate Simulation is investigating use cases such as digital twins of production workloads. They provide isolated security workspaces, allowing collaboration for low-sensitive, scientific data exploration.

Reid Ormseth, NASA Goddard Space Flight Center

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